

28-OCT-09
18:08:08

GEORGIA DEPARTMENT OF TRANSPORTATION
PRECONSTRUCTION DIVISION - OFFICE OF BRIDGE & STRUCTURAL DESIGN
THE ANALYSIS AND DESIGN OF PIERS FOR BRIDGES - V 4.2.07 - AASHTO SPECS 1984 INTERIM
REVISED: JUNE 30, 2008
40' CURB-CURB; 6 BEAMS; 140' SPAN; 30' TALL; BRIDGE 13 ; PIER 22,23

PROB. NO. 0001

DESIGN NO.	NO. CAN	NO. COL	NO. LLC	SKEW D	ANG M	F'C PSI	FC PSI	N	FY PSI	FS PSI	DESIGN DATA EC KSI	ES KSI	CONC. STRAIN	Z FACT	* MAIN SIZE	* STR TOP	* CAP MAX	REINFORCING MAX	STEEL MIN	* TOP NO.	* * CAP MIN	* * CAP INCR.	* * CAP BOT			
D	D	D	L	2	1	13	0-00-00	3500.	1400.	8.	60000.	24000.	3409.	29000.	0.0030	170.	11	5	16	16	11	2	2.00	4.00	3.00	2.00

COLUMN REINFORCING	MIN.P	MAX.P	CL.SP.	STEEL CLEAR	R MODE	KL COEF	OC	OF	CM	BD1	BD2	IMPACT %	SOIL KCF	WT KSF	ALL.S.P.	MIN PL	MAX SP	EDGE DIST	PILE DEPTH	REBAR CLEAR	ALL.PILE CAPACITY	PILE UPLIFT	ALL.PILE I P
1.00	8.00	2.50	3.750	2	2.00	0.70	0.90	1.00	1.00	0.75	18.87	0.120	0.000	3.00	9.00	1.250	1.000	3.000	235.000	-9.999			

CAP DATA

CN	C	L	A	DE	BC	BE	DH	LH	XB1	XB2	XB3	XB4	XB5	XB6	XB7	XB8
11	L	21.625	6.000	4.000	6.000	6.000	4.000	15.625	20.500	8.200	6.300					
12	2	SAME AS CANTILEVER 1														

COLUMN DATA

CN	P	I	T	S	HT	A	DT	BT	DB	BB	DL	FLEX	ND	NB	SZ	ND	NB	SZ	ND	NB	SZ	SLOPE	EP	AP			
21	1	C	T		30.000	0.000	12.000	6.000	12.000	6.000	6.000	0.000	12	6	11	12	6	11	34	16	11	34	16	11	0.000	0.000	0.000

FOOTING DATA

CN	S/P	B	D	T	DEL.B	DEL.D	DEL.T	R.B/D	R.D/B	S.HT.	NP	SYM.	BP	DP	SET.
31	P	14.000	14.000	3.000	0.500	0.500	0.250	1.000	1.000	2.500	4	3	0.000	0.000	0.000

GROUP II WIND

WIND FT1	WIND FT2	WIND FT3	WIND FT4	WIND FT5	WIND FT1	WIND FT2	WIND FT3	WIND FT4	WIND FT5	* WIND FORCE APT	* WIND ON PIER PL					
1365.	2730.	1	50	0	44	6	41	12	33	16	17	19	7.375	7.375	4.071	15.364

GROUP III WIND

STD. WIND FT1	STD. WIND FT2	STD. WIND FT3	STD. WIND FT4	STD. WIND FT5	* STD. WIND FT1	* STD. WIND FT2	* STD. WIND FT3	* STD. WIND FT4	* STD. WIND FT5	* WIND ON LIVE LOAD APT	* WIND ON LIVE LOAD PL	LENGTHS OF TRANS.	LL LONGI.	* WIND ON LL APT	LL ARMS APL										
1	50	0	44	6	41	12	33	16	17	19	1	100	0	88	12	82	24	66	32	34	38	140.0	280.0	15.583	15.583

MISCELLANEOUS FORCES

CENTRI. FT	TRACTION FL	FORCE APT	AND ARMS APL	EXPANSION COEFFICIENT	SHRINKAGE COEFFICIENT	STREAM PT	FLOW PL
0.000	9.860	15.583	15.583	0.00018000	0.00044000	0.000	0.000

DEAD LOAD SUPERSTRUCTURE AND LIVE LOAD CASES

I.D.	NL	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12
D.L.	0	261.182	324.730	0.000	649.461	0.000	324.730	261.182					
LL 1	1	80.157	57.255	0.000	0.000	0.000	0.000	0.000					
LL 2	2	80.157	99.242	0.000	95.425	0.000	0.000	0.000					
LL 3	3	80.157	99.242	0.000	190.848	0.000	41.987	0.000					
LL 4	1	0.000	0.000	0.000	0.000	0.000	57.255	80.157					
LL 5	2	0.000	0.000	0.000	95.425	0.000	99.242	80.157					
LL 6	3	0.000	41.987	0.000	190.848	0.000	99.242	80.157					
LL 7	1	0.000	28.627	0.000	108.784	0.000	0.000	0.000					
LL 8	2	55.346	108.784	0.000	110.692	0.000	0.000	0.000					
LL 9	3	55.346	108.784	0.000	192.758	0.000	55.346	0.000					
LL10	2	0.000	41.986	0.000	190.848	0.000	41.987	0.000					
LL11	3	80.157	99.242	0.000	190.848	0.000	41.987	0.000					
LL12	2	80.157	57.255	0.000	0.000	0.000	57.254	80.157					
LL13	3	80.157	99.242	0.000	95.425	0.000	57.254	80.157					

COLUMN MOMENTS(KIP-FEET), SHEARS(KIPS), REACTIONS(KIPS)

TRANSVERSE

*

LONGITUDINAL

LOAD	COL	PC	MT	V	MB	RF	ML	MR	MT	V	MB	MF
UNIT F.AT CL.CAP	1	0.000	-6.000	1.000	30.000	0.000	0.000	0.000	6.000	1.000	30.000	30.000
DEAD LOAD TOTAL	1	2076.435	0.000	0.000	0.000	2335.635	10570.197	-10570.197	0.000	0.000	0.000	0.000
TRAC. FORCE 1 LN	1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-212.808	-9.860	-449.448	-449.448
WIND ON SUBSTR.	1	0.000	-24.426	4.071	122.130	0.000	0.000	0.000	-92.184	-15.364	-460.920	-460.920
GROUP 2 WIND 1 1	1	0.000	-937.270	72.321	2672.974	0.000	0.000	0.000	-92.184	-15.364	-460.920	-460.920
GROUP 2 WIND 1 2	1	0.000	-937.270	72.321	2672.974	0.000	0.000	0.000	92.184	15.364	460.920	460.920
GROUP 2 WIND 2 1	1	0.000	-827.729	64.131	2366.873	0.000	0.000	0.000	-311.267	-31.744	-1073.123	-1073.123

											PIER-40-6-140-30.OUT				
GROUP	WIND	2	2	1	0.000	-827.729	64.131	2366.873	0.000	0.000	0.000	311.267	31.744	1073.123	1073.123
GROUP 2	WIND	3	1	1	0.000	-772.958	60.036	2213.822	0.000	0.000	0.000	-530.349	-48.124	-1685.325	-1685.325
GROUP 2	WIND	3	2	1	0.000	-772.958	60.036	2213.822	0.000	0.000	0.000	530.349	48.124	1685.325	1685.325
GROUP 2	WIND	4	1	1	0.000	-626.903	49.116	1805.687	0.000	0.000	0.000	-676.404	-59.044	-2093.460	-2093.460
GROUP 2	WIND	4	2	1	0.000	-626.903	49.116	1805.687	0.000	0.000	0.000	676.404	59.044	2093.460	2093.460
GROUP 2	WIND	5	1	1	0.000	-334.793	27.276	989.417	0.000	0.000	0.000	-785.945	-67.234	-2399.561	-2399.561
GROUP 2	WIND	5	2	1	0.000	-334.793	27.276	989.417	0.000	0.000	0.000	785.945	67.234	2399.561	2399.561
GROUP 3	WIND	1	1	1	0.000	-583.343	35.696	1440.054	0.000	0.000	0.000	-27.655	-4.609	-138.276	-138.276
GROUP 3	WIND	1	2	1	0.000	-583.343	35.696	1440.054	0.000	0.000	0.000	27.655	4.609	138.276	138.276
GROUP 3	WIND	2	1	1	0.000	-514.221	31.559	1271.644	0.000	0.000	0.000	-165.899	-12.883	-475.096	-475.096
GROUP 3	WIND	2	2	1	0.000	-514.221	31.559	1271.644	0.000	0.000	0.000	165.899	12.883	475.096	475.096
GROUP 3	WIND	3	1	1	0.000	-479.660	29.491	1187.439	0.000	0.000	0.000	-304.142	-21.157	-811.915	-811.915
GROUP 3	WIND	3	2	1	0.000	-479.660	29.491	1187.439	0.000	0.000	0.000	304.142	21.157	811.915	811.915
GROUP 3	WIND	4	1	1	0.000	-387.498	23.975	962.893	0.000	0.000	0.000	-396.305	-26.673	-1036.462	-1036.462
GROUP 3	WIND	4	2	1	0.000	-387.498	23.975	962.893	0.000	0.000	0.000	396.305	26.673	1036.462	1036.462
GROUP 3	WIND	5	1	1	0.000	-203.173	12.943	513.800	0.000	0.000	0.000	-465.427	-30.810	-1204.871	-1204.871
GROUP 3	WIND	5	2	1	0.000	-203.173	12.943	513.800	0.000	0.000	0.000	465.427	30.810	1204.871	1204.871
LIVE LOAD	LL	1	1	1	137.412	-2347.455	0.000	2347.455	137.412	2347.455	0.000	0.000	0.000	0.000	0.000
LIVE LOAD	LL	2	1	1	274.824	-2863.895	0.000	2863.895	274.824	2863.895	0.000	0.000	0.000	0.000	0.000

□ COLUMN MOMENTS(KIP-FEET), SHEARS(KIPS), REACTIONS(KIPS)

													* TRANSVERSE			LONGITUDINAL		
LOAD	COL	PC	MT	V	MB	RF	ML	MR	MT	V	MB	MF						
LIVE LOAD	LL	3	1	371.011	-2112.709	0.000	2112.709	371.011	2577.506	-464.796	0.000	0.000	0.000					
LIVE LOAD	LL	4	1	137.412	2347.455	0.000	-2347.455	137.412	0.000	-2347.455	0.000	0.000	0.000					
LIVE LOAD	LL	5	1	274.824	2863.895	0.000	-2863.895	274.824	0.000	-2863.895	0.000	0.000	0.000					
LIVE LOAD	LL	6	1	371.011	2112.709	0.000	-2112.709	371.011	464.796	-2577.505	0.000	0.000	0.000					
LIVE LOAD	LL	7	1	137.411	-352.112	0.000	352.112	137.411	352.112	0.000	0.000	0.000	0.000					
LIVE LOAD	LL	8	1	274.822	-2472.636	0.000	2472.636	274.822	2472.636	0.000	0.000	0.000	0.000					
LIVE LOAD	LL	9	1	371.011	-1612.692	0.000	1612.692	371.011	2225.373	-612.680	0.000	0.000	0.000					
LIVE LOAD	LL	10	1	274.821	0.012	0.000	-0.012	274.821	516.428	-516.440	0.000	0.000	0.000					
LIVE LOAD	LL	11	1	371.011	-2112.709	0.000	2112.709	371.011	2577.506	-464.796	0.000	0.000	0.000					
LIVE LOAD	LL	12	1	274.823	-0.012	0.000	0.012	274.823	2347.455	-2347.443	0.000	0.000	0.000					
LIVE LOAD	LL	13	1	371.011	-464.807	0.000	464.807	371.011	2577.506	-2112.698	0.000	0.000	0.000					

□ CAP ANALYSIS AND DESIGN DATA

														** CAP MOMENTS AND SHEARS							
														MOMENTS(KIP-FEET)				SHEARS(KIPS)			
POINT	D.L.TOT.	G1 MAX.+	G1 MAX.-	G2 MAX.+	G2 MAX.-	G3 MAX.+	G3 MAX.-	DL T.LT	DL T.RT	G1 + LT	G1 + RT	G1 - LT	G1 - RT								
P 1	-3.033	-3.033	-3.033	-3.033	-3.033	-3.033	-3.033	-5.455	-344.991	-5.455	-344.991	-5.455	-519.012								
P 2	-3028.154	-3028.154	-4455.125	-3028.154	-3028.154	-3028.154	-3882.628	-396.200	-818.349	-396.200	-818.349	-570.221	-1207.824								
P 3	-8344.538	-8344.538	-12225.202	-8344.538	-8344.538	-8344.538	-10668.290	-871.373	-871.373	-871.373	-871.373	-1260.848	-1260.848								
C 1L	-13741.256	-13741.256	-19958.771	-13741.256	-13741.256	-13741.256	-17464.318	-927.533		-927.533		-1317.008									
C 1R	-13741.256	-13741.256	-19958.771	-13741.256	-13741.256	-13741.256	-17464.318		927.533		1317.008		927.533								
P 5	-8344.538	-8344.538	-12225.203	-8344.538	-8344.538	-8344.538	-10668.290	871.373	871.373	1260.848	1260.848	871.373	871.373								
P 6	-3028.155	-3028.155	-4455.126	-3028.155	-3028.155	-3028.155	-3882.629	818.349	396.200	1207.824	570.221	818.349	396.200								
P 7	-3.034	-3.033	-3.034	-3.034	-3.034	-3.033	-3.034	344.991	5.454	519.012	5.454	344.991	5.454								

														CAP DESIGN DATA													
														LEFT STIRRUPS		RIGHT STIRRUPS		D		FC		PS		FS/FF		FS/FZ	
PT.	M+ UNF. K-FT.	M- UNF. K-FT.	TOP REINFORCE. AS NO. SIZE.		BOT. REINFORCE. AS NO. SIZE.		M.SP. AV/IN BAR&SPAC		M.SP. AV/IN BAR&SPAC		D IN.		FC PSI		PS %		FS/FF RATIO		FS/FZ RATIO								
P 1	-2.333	-2.333	3.12	2 # 11	3.12	2 # 11	0.00	0.000	#5@ 0.00	24.00	0.069	#5@ 8.92	51.46		0.09	0.000	0.011										
P 2	-2329.350	-2986.637	13.87	9 # 11	3.12	2 # 11	24.00	0.060	#5@10.33	24.00	0.181D#5@ 6.85	76.64		0.28	0.593	1.225											
P 3	-6418.875	-8206.377	30.68	20 # 11	3.12	2 # 11	24.00	0.126	#5@ 4.94	24.00	0.126	#5@ 4.94	96.00		0.50	0.587	0.991										
C 1-10570.197-13434.092			48.32	31 # 11	3.12	2 # 11	24.00	0.122	#5@ 5.10	24.00	0.122	#5@ 5.10	102.00M		0.73	0.588	0.928										
P 5	-6418.876	-8206.377	30.68	20 # 11	3.12	2 # 11	24.00	0.126	#5@ 4.94	24.00	0.126	#5@ 4.94	96.00		0.50	0.587	0.991										
P 6	-2329.350	-2986.638	13.87	9 # 11	3.12	2 # 11	24.00	0.181D#5@ 6.85	24.00	0.060	#5@10.33	76.64		0.28	0.593	1.225											
P 7	-2.333	-2.334	3.12	2 # 11	3.12	2 # 11	24.00	0.069	#5@ 8.92	0.00	0.000	#5@ 0.00	51.46		0.09	0.000	0.011										

NOTE: *** FS/FZ RATIO EXCEEDS 1.0! ***

NOTE: *** CAP DEPTH HAD TO BE INCREMENTED FOR DESIGN! REVIEW REBAR CONSTRAINTS! RE-ANALYZE IF NEW DEPTH IS USED!
 □ COLUMN ANALYSIS AND DESIGN OUTPUT

CRITICAL COLUMN LOADS

CN	T	B	GR	LLC	WC	R	E	C	S	PF	MTF	MLF	PM	MTM	MLM	PU	MTU	MLU	PU/PM	B	D
1	T		1	LL 2	0.0					3296.0	-6217.5	0.0	3296.0	6217.5	2121.4	15385.5	29079.7	9921.9	4.675	72.00	144.00
1	B		1	LL 2	0.0					3633.0	6217.5	0.0	3633.0	6217.5	2338.3	15903.4	27291.4	10263.7	4.387	72.00	144.00

COLUMN DESIGN DATA

CN	T	B	FACE 1	B	FACE 2	D	FACE 3	D	FACE 4	AS	PS	BD12	BD	SUMPU	SUMPC	DEL.T	DEL.L	CM	R	PHIC
1	T		16 # 11		16 # 11		18 # 11		18 # 11	106.08	1.023	1.00	0.000	3464.	186646.	1.000	1.073	1.000	2	0.70
1	B		16 # 11		16 # 11		18 # 11		18 # 11	106.08	1.023	1.00	0.000	3464.	186646.	1.000	1.073	1.000	2	0.70

FOOTING 1 DESIGN LOADS

F	G	LLID	WC	ES	C	S	P	MT	VT	ML	VL	P4	P3	P2	P1	MTF	VBF	VPF	LOAD
1	3	LL 3	3.1				2647.749	2964.767	29.491-2025.426	-47.779	210.726	151.747	234.230	293.208	143.873	0.000	44.206	MAX.P1	
1	3	LL 2	1.1				3336.881	5004.117	46.405-1348.324	-31.628	231.971	192.735	331.444	370.680	191.851	0.000	55.795	MAX.MT	
1	3	LL 2	1.1				3336.881	5004.117	46.405-1348.324	-31.628	231.971	192.735	331.444	370.680	191.851	0.000	55.795	MAX.VT	
1	3	LL 3	3.1				3442.074	3854.197	38.338-2633.053	-62.113	273.943	197.272	304.499	381.171	187.035	0.000	57.468	MAX.VP	
1	3	LL 3	3.1				3442.074	3854.197	38.338-2633.053	-62.113	273.943	197.272	304.499	381.171	343.764	59.710	57.468	MAX.ML	
1	3	LL 3	3.1				3442.074	3854.197	38.338-2633.053	-62.113	273.943	197.272	304.499	381.171	343.764	59.710	57.468	MAX.VL	
1	3	LL 2	3.1				2566.832	3596.706	29.491-1710.812	-40.877	192.089	142.195	241.307	291.201	145.357	0.000	42.919	MAX.P3	

FOOTING 1 ANALYSIS/DESIGN RESULTS

FOOTING SIZE				* BAR REINFORCEMENT STEEL *					SECTION CAPACITIES *			
B	D	T	P1/PA	AS	NO.SIZE	SPAC.	PLACEMENT	MT.	VB	VP	DS	FC
20.500	20.500	5.750	0.998	1.10	29 # 8	@ 8.375	TOP TRAN	257.943	63.035	126.071	52.230	0.000
				1.47	24 #10	@10.250	BOT.LONG	348.691	64.405	128.810	53.365	0.000

NUMBER OF PILES = 14 BP = 3.000 DP = 3.000